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PUBLISHER'S NOTE



The launch of Sputnik 1 on October 4, 1957, truly was a shot heard 'round the world. In an instant, everything changed as the United States and the former Soviet Union began a frantic race for space. On January 31, 1958, a mere four months after the liftoff of Sputnik, the United States launched its own first successful satellite, Explorer 1. On that same day, I celebrated my fifth birthday.

Label it euphoric recall if you will—the fact of the matter is that the U.S. achievement, coming on the heels of disgrace at the hands of our Soviet competitors, was widely and, in some quarters, wildly feted. For me and for many others, it began a lifelong fascination with rockets, satellites, and a Man in Space.

Since Sputnik, the science of communications via satellite has come far. From the passive repeaters and transmitters of the late '50s to the small yet capable active relays of the early '60s, the trends for the future crystallized. More powerful satellites offering greater services at lower costs to more and more people around the world quickly became the expected norm. The launch of the world's first commercial satellite, Intelsat 1, also known as Early Bird, in April 1965, heralded the advent of a new age in telecommunications as dramatically and as effectively as Sputnik had sounded the starting gun of a decades-long space race just eight years before.

Intelsat achieved global coverage before the '60s bowed out. Almost immediately thereafter national satellite networks started to appear—first in Canada, then in Indonesia, Mexico, the United States and elsewhere. Specialized spacecraft such as the Marisat satellites expanded the service mandates of these new-fangled and much-beloved orbital messengers. From there it was a series of short steps to specialized business services via satellite, direct-to-home television broadcasts, so-called “separate” international systems, navigation and location, even esoteric applications with names like telemedicine and off-track betting.

Today we stand at the threshold of new services such as worldwide mobile handheld telephony— instant access anytime, anywhere. The global village of tomorrow will fit into the vest pocket of your jacket today. As we hurdle toward the next millennium, it's useful and fun to take a look back to Sputnik and the beginnings of a world forever different—and better—thanks to communications via satellite.

Scott Chase
Publisher and Executive Editor
Via Satellite

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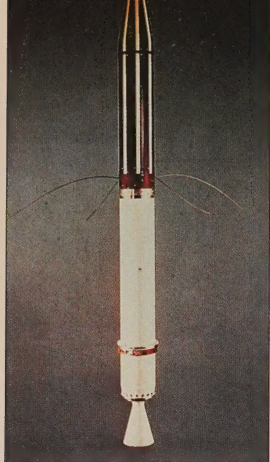


Photo courtesy of NASA

SPUTNIK'S THE INSPIRATION LAUNCH

by Robert N. Wold

Above: The Explorer 1 spacecraft, officially known as Satellite 1958 Alpha, was the first U.S. satellite to obtain Earth orbit.

FORTY YEARS AGO, the Soviet-built Sputniks 1 and 2 became the first two man-made satellites of the planet Earth. The United States had also been preparing to launch satellites but the Soviets seized, as it turned out, an immense psychological advantage for being "first."

It all happened during the 12th year of an often-bitter, 46-year Cold War (1945-1991) between the United States and the former U.S.S.R.

The American leader, a calm Dwight Eisenhower—who knew much more about the status of Soviet technical capabilities than

Soviet rocket and missile prowess that stood ready to be used.

As the Space Race heated up, the U.S. Congress voted to invest incredible amounts of money into the developing space-age technology. In NASA's peak spending year, 1965, the administration was budgeted \$5.25 billion (which today would equal \$24.1 billion due to inflation). Other nations also became very involved. The profound results—scientific, commercial and military—are, in a large sense, the legacy of Sputnik and the spirited technological competition it spawned.

America's surveillance system.

Members of the U.S. Congress, not to mention their constituents, were not privy to this information, held closely by Eisenhower and the National Security Council. When Sputnik happened, both Republican and Democratic Congress members heaped criticism on the Eisenhower administration. In the media, political cartoonists lampooned the Administration as being half asleep and embarrassingly behind the Soviets in technology.

As early as 1945, however, the United States had undertaken a mammoth rocket research and

FORTY YEARS AFTER SPUTNIK AND EXPLORER, 178 COMMERCIAL

he was ever able to publicly reveal—was in the fifth year of his eight-year Presidency. The Sputnik events created a level of political friction between the Republican administration and Congress that probably enabled the Democrats to win their slim victory in the next Presidential election.

The Soviets' political leader was the bellicose, fist-shaking Nikita S. Khrushchev, who was warning one and all not to interfere with the Soviets' occupation problems in Hungary. Sputnik, he said, was a dramatic exhibition of

October 4, 1957, is not quite as memorable in the minds of Americans as December 7, 1941. For the multitude of Americans, however, the rude awakening by October's Sputnik seemed to come from out of nowhere, just like that December "day of infamy" at Pearl Harbor and the start of World War 2.

President Eisenhower had known the Soviets would soon launch a satellite but not when. He also knew it would be a peaceful satellite, not a ballistic missile, but could not reveal details for fear of violating the security of

development effort that employed the cream of Germany's renowned civilian rocket scientists who had surrendered to U.S. occupation forces. The Soviets had also been secretly developing powerful rockets since the end of World War II.

By 1950, the United States had undertaken highly secret research and development for a fleet of spy satellites. In March 1955, Eisenhower quietly approved plans for America's first spy satellite, WS-1171, while simultaneously encouraging the three U.S. military forces to publicly compete for

LEGACY FOR AMERICA'S INTO SPACE

the honor of constructing a U.S. scientific satellite that would be needed for the nation's participation in the International Geophysical Year (IGY), a sort of worldwide "science fair" displaying the latest accomplishments, that would extend from July 1957 to December 1958.

Soviet scientists had publicly announced in April 1955 their plans to participate with a satellite during the IGY. Three and one-half months later, the White House announced the intent of the United States to orbit a scientific research satellite during the IGY.

By now, a special committee in the Department of Defense (DoD) had voted for the Navy's proposal to use a new rocket launching vehicle called Vanguard. It won out over the Army's proposal to use a Jupiter rocket and the Air Force proposal to use a version of the powerful, untested Atlas rocket.

every 96 minutes. In a three-tier banner headline, The New York Times called it "a man-made earth satellite."

Radio signals of musical "pings" from the satellite were retrieved and re-broadcast to astonished audiences via the CBS and NBC networks and the BBC. The Soviets called the satellite "Sputnik," which translates to "friendly traveler."

Launched from Tyuratam in the Soviet Union, Sputnik 1 weighed just 184.3 pounds (83.6 kg) and continued to send signals for 21 days before decaying three months after launch on January 4, 1958. Years later, Soviet scientist Sergei Pavlovich Korolev revealed that Sputnik 1 had been constructed in less than thirty days.

Sputnik 2, in orbit thirty days after Sputnik 1's launch, was six times heavier than its predecessor and carried an 11-pound (5 kg) female mongrel dog named Laika ("barker"), strapped with diag-

but several carried one or two dogs that, unlike Laika, were recovered alive.

The Blowup of Vanguard

The Army had lobbied hard to be first for the United States in space, but the Navy's Project Vanguard had been selected and was rushed to be launched from Cape Canaveral at Cocoa Beach, FL, on December 6, 1957.

The launch had lasted only two seconds when the rocket bearing the satellite burst into flames. The New York Times reported from Washington, "The

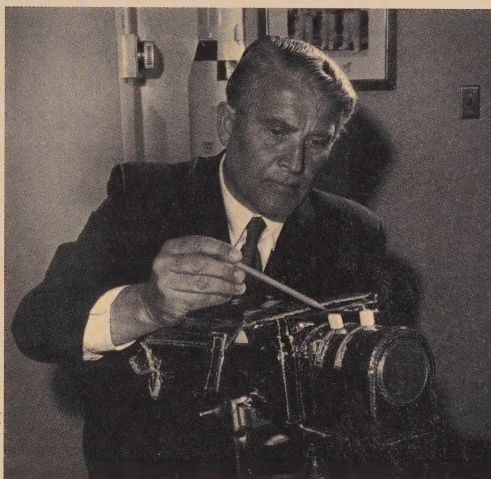


Photo courtesy of NASA

failure of the Vanguard satellite rocket saddened and humiliated the nation's capital today."

The Success of Explorer

One month before Vanguard, the Secretary of Defense had ordered the Army Ballistic Missile

Above: Dr. Wernher von Braun headed the ABMA team that provided the Jupiter rocket responsible for delivering the first U.S. satellite, Explorer 1, into orbit.

COMMUNICATIONS SATELLITES ARE IN ORBIT FOR 49 OPERATORS

The Soviets Surprise the World

The IGY was a little more than three months old when a "new moon," as one London tabloid described it, was launched into an elliptical orbit circling the globe

nostic and data-transmission instruments. The signals from Sputnik 2 and Laika expired after only seven days.

In fact, there were 11 Sputnik launches by March 1961, not all of them scientifically successful

Agency (ABMA) to develop within 90 days a new satellite carrying a scientific research package for a Jupiter launch at Cape Canaveral.

Dr. Wernher von Braun's team at ABMA's Huntsville Arsenal in Alabama would provide the

Jupiter rocket and Jet Propulsion Laboratories (JPL), a unit of Pasadena's California Institute of Technology under contract to the Army, would provide the satellite payload.

Dr. William A. Pickering, the director of JPL, put his team to work around-the-clock to design, develop, test and build the satellite. In the scientific package, the most productive segment would prove to be a cosmic ray unit developed by the distinguished radiation physicist at the University of Iowa, Dr. James A. Van Allen.

Miraculously, JPL's satellite for the Army—the 31 pound (14 kg) Explorer 1—was ready for launching by the last week of January 1958, only four months after Sputnik 1. The horse race in space was narrowing.

ABMA succeeded in launching Explorer 1 on January 31, providing the first scientific discovery of

the Space Age, the radiation belts which circle planet Earth. The Van Allen Radiation Belts were, of course, named after Dr. Van Allen.

Explorer's success was a source of great relief to many Americans. Some groused, however, that "The Sputniks weighed 184 and 1,110 pounds compared to Explorer's measly 31 pounds." Americans have always preferred heavy-weight fighters.

The Race for Space

The huge psychological impact of the Sputniks lingered, with many Americans sustaining an inferiority complex as to their nation's excellence in science, education and the military. Fear prevailed that the Soviets held the lead in developing long-range missiles.

Congress was pushing hard for new leadership in the American space program. It wanted a strong organization, which it would fund

liberally, and an organization head who could reinstate America's scientific and technological leadership.

By March 1958, Eisenhower and his science advisors made the Congress-approved recommendations for forming the National Aeronautics and Space Administration (NASA) to manage all non-military space activities. T. Keith Glennan, president of Case University, became NASA's first administrator. When the Democrats won the Presidential election in 1960, Glennan was replaced as NASA's administrator by James E. Webb.

Soon, an opportunistic private industry joined the massive race-for-space program, laying the groundwork for the vibrant and still growing commercial space industry that exists today.

The United States began realizing launch successes with research projects such as more Explorers, Score, Pioneer, Discoverer, Tiros, Midas and Echo.

From 1957 through 1960, according to TRW's *Space Log*, the U.S.S.R. had nine successful space launches and the United States had 34. By 1965, the totals to date were U.S.S.R.: 130 and the United States: 273. On through the 1980s, however, the Soviets dominated the successful launch tallies, with 66 percent of the world's successful space launches, as opposed to the United States' 29 percent.

With the Kennedy administration's arrival in January 1961, NASA's principal work became the man to the moon project. The United States poured billions of dollars into this and related projects to be certain of their success.

In the same speech that advocated men-to-the-moon, President Kennedy unveiled a global communications satellite system "dedicated to fostering world peace and understanding." The U.S. participating company, Comsat, was incorporated in Feb-

COUNTING TRAFFIC IN SPACE

To strengthen national security, the U.S. Department of Defense (DoD) had by the mid-1950s initiated numerous space-related projects.

To implement many of these projects, the Continental Air Defense Command was established at the beginning of 1956. It then gave way in May 1958 to the North American Aerospace Defense Command (NORAD), which to this day oversees air defense for the United States and Canada.

The first Space Surveillance Center began operations on November 30, 1957, at Hanscom Field, MA, less than two months after the launch of Sputnik 1. The unit received, processed and catalogued data on all space objects.

Today, the U.S. Space Command, located inside Cheyenne Mountain near Colorado Springs, CO, maintains a continuous "Satellite Boxscore." A recent edition identified 8,635 man-made objects including 2,325 satellites, 81 space probes and 6,229 "other" man-made objects currently flying above us.

Since Sputnik, many thousands of objects have burned and disappeared upon reentering earth's atmosphere.



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ruary 1963, followed by creation of the worldwide system, Intelsat, in 1964.

Commercial Communications Satellites

Major corporations such as AT&T, RCA, Bendix, Hughes Aircraft and others rallied to the space program. They became highly valuable vendors to NASA and the DoD, which of course was supervising vast military projects in space.

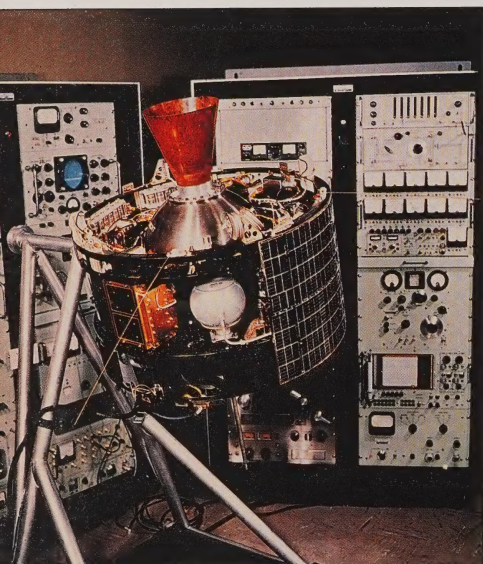


Photo courtesy of NASA

Above: Syncom 5 and its predecessors in the Syncom series represented several firsts for the satellite industry, including the introduction of spin stabilization, the first synchronous orbit, and the first geostationary orbit.

The "first communications satellite" was the low-altitude Score, constructed for the U.S. Army Signal Corps by RCA and launched in December 1958. It transmitted the first-ever human voice sent from space to earth, a recorded Christmas greeting from President Eisenhower.

For NASA, RCA also constructed two mid-altitude Relay communication satellites that were launched in December 1962 and January 1964. Among other things, Relay experimentally transmitted to Japan the news of President Kennedy's assassination in November 1963.

In 1961, AT&T obtained NASA's consent to demonstrate, at AT&T's expense, the global satellite capabilities it had in mind for its AT&T International entity. Telstar 1 and Telstar 2, in elliptical orbits, were launched successfully in 1962-1963.

More and more, scientists began to believe that geosynchronous orbiting of satellites at the magic altitude of 22,300 miles above the equator—predicted by Arthur C. Clarke in 1945—would soon become a reality. By 1964, it had.

At Hughes Aircraft, engineers had been working since 1959 on a unique spinning configuration that would solve many electronic problems for a satellite that might one day be in orbit at the magic altitude. After a difficult selling effort, Hughes obtained financing from NASA and the DoD for the experimental Syncom series.

Syncom 1 failed to reach final orbit, but in the same year, 1963, Syncom 2 became the world's first synchronous-orbit satellite. Syncom 3, in 1964, became the first-ever bird in geostationary orbit. Early Bird, modeled after Syncom 3, was constructed for Comsat and became the first commercial communications satellite after its launch on April 6, 1965. Its ownership was soon to be transferred to the new Intelsat and the satellite was renamed Intelsat 1.

Forty years after Sputnik and Explorer, 172 commercial communication satellites are in orbit for 49 operators, increasing annually by an average of 25 new satellites, according to *Via Satellite*. New commercial communication satellites valued at \$54 billion will be constructed by the year 2000.

What If Sputnik Had Been Second

In the early 1980s, author John Noble Wilford posed a provocative might-have-been: What if the United States had launched the first satellite?

Wilford opined that "an American first would not have startled the world as much as Sputnik did, for American technological leadership was taken for granted."

He continued, "The impact of Sputnik, when it followed, would have been much less—another case of the Russians catching up, as with the atomic and hydrogen bombs."

Wilford then asked the big question: "If Sputnik had thus seemed less threatening, would the United States have reacted with the kind of space program that it eventually mobilized?" We'll never know.



Robert N. Wold, whose company pioneered commercial satellite services for the television, radio and entertainment industries, is now an author chronicling satellite history. He may be reached in California at 714/363-0993 or by fax at 714/363-2093, or by email at robertnwold@home.com.

Below: Telstar 2, shown being lifted into orbit, and the previous Telstar 1 represented AT&T's first introduction to the satellite industry.



Photo courtesy of NASA

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FROM CONCEPT TO COMMERCIAL SATELLITES

THE CONCEPT OF international satellite communications dates back at least to 1945, when Arthur C. Clarke first proposed a system of space stations to provide high-quality, reliable television and radio broadcasting. Clarke's propitious idea, seemingly advanced for its time, was executed within a quarter-century,

related research for military and scientific purposes based on German V-2 rocket technology. In 1957 the Soviets launched the first two satellites and the United States responded with a large financial and political commitment to space research.

As a result of a wide array of U.S. government and private industry experiments, satellites were developed that could be used for communications within five years. Simultaneously, the United States created an international telecommunications satellite organization, Intelsat, dedicated to the deployment of a global satellite system for telephone and television transmission services. By the late 1960s, the international consortium confirmed the commercial potential of satellite communications, and Clarke's global system, proposed less than 25 years earlier, proved to be not only a practical reality, but a profitable one as well.

concerned with the inefficient system used for early television broadcasting.

"Unsatisfactory though the telephone and telegraph position is," he lamented, "that of television is far worse...The service area of a television station, even on a very good site, is only about a hundred miles across. To cover a small country such as Great Britain would require a network of transmitters, connected by coaxial lines, waveguides or VHF relay links."

Undaunted by these limitations, Clarke presented a solution to the problems of global communications and broadcasting—a network of satellites in geostationary orbit that could receive and retransmit voice and video signals to all areas of the globe. If situated in geostationary orbit (22,300 miles, or 35,680 km, over the equator) Clarke demonstrated that a satellite "would revolve with the earth and would thus be stationary above the same spot on the planet. It would remain fixed in the sky of a whole hemisphere and unlike all other heavenly bodies would neither rise nor set." With the satellite remaining "fixed" in the sky, the need for complex tracking by earth stations would be eliminated, and 24-hour coverage would be achieved. In addition, a global system could be created by three satellites positioned over the Pacific, Atlantic and Indian Oceans that potentially could receive, relay and downlink signals to and from any earth station.

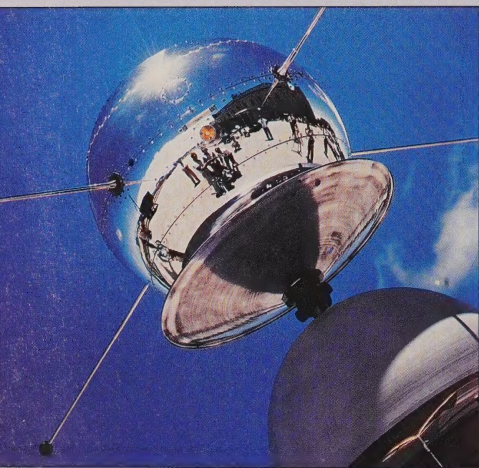


Photo courtesy of NASA

Extraterrestrial Relays

In his now-famous *Wireless World* article, "Extraterrestrial Relays," Arthur C. Clarke published his concept of a global broadcasting system based on satellites. Popular today for his science fiction works, *2001: A Space Odyssey* and *2010*, Clarke, a young engineer at the time, described in his article the prevailing obstacles to effective telecommunications and the need to implement a more efficient method of electronic signal transmission. Clarke particularly was

when technological innovations and political events led to the realization of a global communications satellite system. "Not for a moment did I consider," Clarke later observed, "that the first crude comsat would be orbiting within 13 years, and that commercial operations would start within 20."

As it turned out, during the first 13 years after Clarke anticipated a global satellite system for communications, the United States was conducting satellite-

Above: Although the Vanguard satellite program launched several satellites successfully into orbit, it was also the United States' first satellite failure in 1957. This Vanguard satellite SLV-2 suffered a similar failure on June 26, 1958.

REALITY COMMUNICATIONS

by Cynthia L. Boeke

Clarke also addressed the high cost involved in building a satellite system. "However great the initial expense," he reasoned, "it would only be a fraction of that required for the world networks replaced, and the running costs would be incomparably less." John Pierce, an American engineer working for AT&T's Bell Laboratories, came to the same conclusion in 1954. He looked at the 36-channel undersea cable (TAT-1) linking Canada and the United Kingdom at a cost of \$35 million, and asked, "Would a channel 30 times as wide, which would accommodate 1,080 phone conversations or one TV signal, be worth 30 times \$35 million?"

Early Rocketry

At the time "Extraterrestrial Relays" was written, Clarke envisioned that rockets themselves would become "artificial satellites, circling the world," once

they achieved an orbital velocity of five miles per second or more. He predicted that first radio-controlled rockets would be sent into orbit that could "broadcast scientific information back to the earth." These would be followed by manned rockets that could "break the orbit and return to earth." Eventually, space stations would be built "using material ferried up by rockets," including receive-transmit equipment so that astronauts could provide "relay transmissions between any two points on the hemisphere beneath."

Clarke asserted that satellite technology was "a logical extension of developments in the last ten years, in particular the perfection of the long-range rocket of which [the German] V-2 was the prototype." After World War II, developments in rocketry evolved from German V-2 missiles. In fact, Wernher von Braun, the leading German rocket scientist, and hundreds of German rocket technicians began working with the United States Army on its Redstone missile program.

Von Braun made one of the first attempts to develop a satellite in 1954, when he proposed to launch a satellite with a Redstone missile under the auspices of Project Orbiter. The plan was to modify the Redstone, renamed Jupiter C, so that it had three stages, and to house a satellite within its last stage.

President Eisenhower agreed to launch a satellite as part of the 1957 International Geophysical

Year (IGY), but selected the Naval Research Laboratory's Project Vanguard instead. The President's rationale was that the U.S. contribution to IGY should be scientific, as opposed to the converted weapons system proposed by von Braun. The goal of the Vanguard program was to conduct a number of experiments in space, and scientists were required to design, develop and build not only a novel satellite but a new rocket as well.

At the time of Eisenhower's decision, three technological advances allowed the use of unmanned satellites: the solar cell, the transistor and the traveling wave tube. The solar cell made it possible to use the sun's energy as a direct power source. The transistor, Clarke later explained, "made it possible for tiny robots to do the work of inhabited space stations." And the traveling wave tube permitted light-weight, efficient amplification of incoming signals over a wide bandwidth for retransmission to receive antennas.

Sputnik and the Space Race

On October 4, 1957, the Soviets astounded the world when they launched Sputnik 1, followed by Sputnik 2, carrying a dog, on November 3. Sputnik 1 was a 2-foot-in-diameter, 185-pound sphere that beamed back information on atmospheric density for three weeks, and for the first time transmitted electromagnetic waves from outside the atmosphere. Sputnik 1 reached a low altitude orbit of 135 miles to 587 miles. Sputnik 2's mission was to determine a living organism's reaction to a space environment.

Americans reacted with fear and surprise. According to Richard Magee, former senior recruiter for Intelsat and an employee at its inception, "We woke up one morning and the Russians had launched Sputnik.

Left: A Delta vehicle lifts off the pad from Cape Canaveral, FL, carrying the Relay 4 experimental satellite.



Photo courtesy of NASA



Photo courtesy of Space Systems/Loral

Above: When people think of what the first civilian communications satellite must have looked like, few will envision the 100-foot diameter aluminum-coated plastic balloon, Echo 1, that actually claimed this distinction.

And that caused a mad scramble in this country, because the Russians had beaten the United States in the space race. The United States was caught completely off guard on that one."

The United States responded with an intensive program of scientific experiments under the newly-created civilian space agency, NASA, and military experiments under the Department of Defense. These programs led to the use of communications satellites in the West within eight years of the first Soviet launch, and within 11 years, Clarke's global satellite system became a reality.

"The first commercial communications satellites benefitted from military work and from the space program," emphasizes Burton Edelson, a pioneer in satellite communications at NASA and Comsat and currently director of the Institute for Applied Space Research at The George Washington University. "The big push at NASA, in particular, was for scientific measurements in space, manned spaceflight, as well as weather and navigational satellites," he said. The world's first geostationary satellite system, according to Edelson, was "the fruit of a vigorous experimental program in satellite communications conducted in the United States in the years immediately following the first Sputnik."

Both NASA and the Defense Department (DoD) undertook

aggressive satellite communications programs. Initially, NASA focused on the development of "passive" satellites, which merely bounce signals off of reflectors. When the DoD launched a satellite that could receive, amplify and retransmit signals back to earth, it became obvious that the future was in "active" satellites. NASA followed with an RFP for the development of an active communications satellite, which was built by RCA. AT&T, which did not win the NASA contract, went on to build its own experimental communications satellite. NASA continued satellite development by placing a communications satellite built by Hughes Aircraft Co. in geostationary orbit.

Milestones in the Development of Communications Satellites

In December 1957 the first U.S. satellite, Vanguard, was destroyed in front of a live television audience, due to a hard-start on the rocket's main engine. In March 1958 Vanguard 1 was successfully launched and placed into an orbit of 404 miles to 2,465 miles. Vanguard 1 was a tiny, 6.5-inch-diameter, 3.3-pound aluminum sphere powered by solar cells and mercury batteries. Vanguard 1 transmitted scientific information back to earth with a built-in Geiger counter and other apparatus until May 1964. Vanguard 2, a 22-pound, 1.7-foot magnesium sphere launched into orbit almost one year later, was equipped with two optical telescopes to observe cloud formations. Vanguard 3, also carrying scientific instruments, was launched in September 1959.

When the December launch of Vanguard failed, the U.S. government turned to Wernher von Braun, who had been proceeding with his satellite project for the Army in secret. On January 31, 1958, the first successful U.S.

satellite was launched on a modified U.S. Army Jupiter C rocket, called the Juno One Space Carrier. Similar in design to Project Orbiter, the first three Explorer satellites were cylindrical, corresponding to the last stage of the Jupiter C. Weighing only 31 pounds, Explorer 1 carried a Geiger counter that was used in the discovery of the Van Allen radiation belt around the Earth. In 1959, NASA began to operate the Explorer series to conduct a wide array of scientific experiments.

In December 1958 the DoD launched SCORE (Signal Communications Orbiting Relay Experiment), the first "crude comsat." SCORE was a simple transmitter on an Atlas rocket used to broadcast President Eisenhower's pre-taped Christmas message.

The first civilian communications satellite, Echo 1, developed by NASA and Bell Laboratories, was launched in August 1960. Echo 1 was a gigantic, 100-foot-diameter, 168-pound, aluminum-coated plastic balloon from which radio signals were reflected back to the earth without being re-amplified. In addition, Echo 1 had two transmitters for relay and tracking, fueled by 140 solar cells. Echo 1 was used to transmit a radio message by President Eisenhower. The significance of Echo, states Edelson, is that it "proved the feasibility of radio transmission via satellite, measured propagation characteristics, and demonstrated the effectiveness of various items of transmitting, receiving, coding, and modulation equipment."

In October 1960 the DoD successfully launched a much more advanced, active communications satellite, Courier. Both Score and Courier, explains Edelson, "proved that delicate and complex electronic equipment could be made to survive the trauma of rocket launch and function in orbit. Courier demonstrated all

communication satellites 1958-1995



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Circle Reader Response 234

essential subsystems of an active satellite—communications, power, telemetry and command.”

Bell Laboratories’ Telstar 1, the first commercially-funded communications satellite, was launched in July 1962. AT&T spent approximately \$50 million to design and develop the satellite. A 3-foot-diameter, 72-sided polyhedral sphere, covered with 3,600 solar cells and weighing 170 pounds, Telstar 1 reached an orbit of 585 miles to 3,533 miles. Telstar was capable of transmitting one television channel between the United States and Europe, or 600 telephone calls. President Kennedy used Telstar to broadcast five-minutes of a live press conference that was televised in Europe. In addition to television and voice, Telstar 1 was used to transmit facsimile and data. In May 1963 Telstar 2 was launched as a follow-on to Telstar.

In December 1962 Relay 1, manufactured by RCA for NASA, was placed in a higher orbit than Telstar, thus increasing its operating time. Relay was a 2.75-foot-high, 2.3-foot-diameter, 172-pound satellite, roughly cylindrical in shape. Relay was covered by over 8,000 solar cells and was able to retransmit 300 one-way voice channels. It was used for microwave experiments and to create television and telephone links between the United States, Europe and Brazil. Launched in January 1964, Relay 2 established voice communications via satellite between the United States and Japan.

NASA’s Syncom 3, built by Hughes Aircraft Co., was the first satellite to be placed in geostationary orbit and proved the great benefits of 24-hour coverage obtained by satellites at 22,300 miles above the equator. According to Dr. Harold Rosen, former technical director of the Syncom program, “The original plan was to have three Syncom satellites, in the hope that at least one would

work.” Syncom 1 was damaged by its apogee motor as it was placed into orbit in February 1963. Five months later, Syncom 2 was launched into geosynchronous, or a slightly inclined, orbit. In August 1964 Syncom 3 became the world’s first geostationary satellite, as a result of advancements in the booster and the spacecraft. “[Whereas] Syncom 2 could handle a few voice channels and narrowband television,” explains Rosen, “Syncom 3 had increased bandwidth that permitted us to transmit the Tokyo Olympics in real time.” The Syncoms were roughly 2-foot-diameter, 150-pound, drum-shaped satellites covered by almost 4,000 solar cells.

Comsat and a Global Satellite Network

After the inauguration of President Kennedy in January 1961, the U.S. space program was accelerated to an unprecedented pace, and NASA’s role was expanded. In May 1961 President Kennedy initiated a space policy declaring that NASA would send a man to the moon by the end of the decade. Along with the highly visible manned space flight program, Kennedy promoted the creation of a communications satellite system as a foreign policy objective. A global system was pursued, Magee contends, because “the

United States did not want the Russians to set up an international communications system that would draw countries out of the U.S. sphere of influence.”

Kennedy took political steps to achieve his goal of a global communications satellite system. In 1961 the United Nations adopted a U.S. initiative stating that “communications by means of satellite should be available to the nations of the world as soon as practicable on a global and non-discriminatory basis.” Congress supported the project by passing the Communications Satellite Act of 1962, instituting a communications satellite organization. By mandate, the new international consortium was a commercial venture that could make money by leasing the use of its satellites, or space segment.

In February 1963 Comsat—the U.S. communications satellite entity—was incorporated. The following year, Comsat signed two “interim” agreements with ten signatories, thus creating an international telecommunications satellite consortium. The first agreements were temporary because many of the members feared the United States would dominate the new international organization through Comsat. Differences were settled in 1971, after grueling negotiations, and in 1973 Intelsat became an official-

Right: The Intelsat 3 satellite receives a final checkout before being launched aboard a Delta launch vehicle.



Photo courtesy of NASA

ly-recognized international legal body.

Even before political compromises were reached, however, the consortium used communications satellites to establish a lucrative business. In 1965, Comsat's first satellite, Early Bird, brought in \$2.1 million. "Prior to Early Bird," Edelson points out, "satellites were experimental. Early Bird made money." Simon Bennett, a former engineer for both Comsat and Intelsat and current consultant to the space industry, agrees: "What Comsat did with Early Bird was to demonstrate communications applications. Telstar and Relay were both used for experiments and did not derive revenue. Early Bird was designed to provide commercial services and was the first to make money."

Intelsat's Early Commercial Communications Satellites

Intelsat 1, commonly referred to as Early Bird, was a single satel-

lite launched in 1965 that provided 240 voice circuits (or one television channel) for transatlantic service. Early Bird was cylindrical in shape, 2 feet high, 2.3 feet in diameter, weighed 85 pounds, and could connect only two earth stations at a time during its planned 1.5-year lifetime. The satellite was built by Hughes. Early Bird's television coverage included President Johnson's address to the United Nations, Pope Paul's visit to New York, election news in West Germany and France, a Beatles concert, the World Boxing Championship and the Irish Derby.

Intelsat 2 satellites, first launched in 1966 and built by Hughes, were capable of providing service to a multiple number of earth stations at one time. This series of satellites was 4.6 feet in diameter and 2.3 feet high. In January 1967 commercial satellite services were established between the United States and Japan, when

an Intelsat 2 was positioned over the Pacific Ocean.

The Intelsat 3 series was even more advanced. These TRW-built satellites provided 1,500 voice circuits, and four television channels. The satellites were able to simultaneously transmit voice, television, and data, and had a lifetime of five years. Like its predecessors, Intelsat 3s were cylindrical. They were 3.3 feet high, and 4.6 feet in diameter.

Most importantly, full global coverage was established when an Intelsat 3 satellite over the Indian Ocean began service in July 1969. Intelsat's network constituted the first worldwide commercial communications satellite system in geostationary orbit.

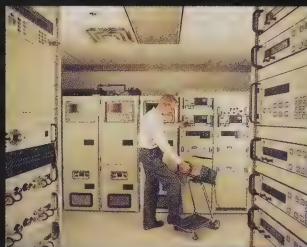


Cynthia Boeke is the editor and associate publisher of Via Satellite.

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TOP OF THE WORLD

THE VAN ALLEN STORY

by Tom Walsh

HE SITS TODAY AMID the canyons of books and papers that are his office within a University of Iowa campus building that bears his name. James A. Van Allen, now 83 and one of the world's pre-eminent space physicists, puffs on his pipe and thinks back to October 4, 1957, the day the Soviet Union successfully launched Sputnik, the world's first satellite.

The space race had begun, with the Soviets setting the pace. America needed a response. Life for Jim Van Allen would never be the same.

"I had a very high level of

respect for their achievement, but my reaction was one of both admiration and disgust," he says today. "I was only somewhat surprised; the Soviets had presented their plans for such a project in August of 1956 at a conference I attended in Barcelona. We had presented our plans, and they had presented theirs. They simply did what they said they would."

The Soviets' historic achievement came as Van Allen was

immersed in his sixth year of using "rockoons"—balloon-launched rockets of his own design—to study cosmic rays, often dispatching them from the decks of ships cruising waters from Greenland to Antarctica.

When launched from Earth, the military surplus rockets would carry Van Allen's cosmic ray detectors to altitudes of 25,000 feet—not quite five miles. When tethered to giant balloons, the rockets could be carried to 80,000 feet before being ignited, climbing eventually to nearly 400,000 feet—75 miles. While it wasn't enough to escape the Earth's gravitational pull, it was enough to provide the raw data Van Allen needed to measure how the Earth's magnetic field interacts with the stream of charged particles that constantly bombard it.

From north to south he made stepped measurements of cosmic ray activity along a wide spectrum of latitudes. Those shipboard expeditions provided the baseline data for the discovery of what are now known as the "Van Allen Radiation Belts"—bands of high-energy protons and electrons beyond the Earth's atmosphere.

News of Sputnik came while Van Allen was aboard the U.S.S. *Glacier* as it steamed toward Antarctica. Within 15 minutes, Van Allen was in the ship's radio

shack, working with the radio operator and a crude signal recorder to track Sputnik's shallow Earth orbit.

"We picked up the signal and tracked it all night," Van Allen recalls.

The success of Sputnik put Van Allen's cosmic ray investigations into space. America's first satellite needed a scientific purpose, and "by virtue of preparedness and good fortune" his Iowa-built cosmic-ray instrument fit the bill. Working closely with rocket pioneer Wernher von Braun and the Jet Propulsion Laboratory in Pasadena, Van Allen devised the payload for America's first satellite—Explorer 1. Just as von Braun had promised, America's answer to Sputnik was launched on a Jupiter C rocket within 120 days of the Soviet space milestone, on January 31, 1958. It was "a moment of exhilaration," Van Allen says.

"Both the vehicle and our instrument worked," he says. "The data from a single Geiger-Mueller tube on Explorer 1 yielded the discovery of the radiation belt of the Earth—a huge region of space populated by energetic charged particles, principally electrons and protons, trapped within the external geomagnetic field."

Launch vehicle failure doomed Explorer 2, but Van Allen's research continued on



James Van Allen

Photo courtesy of NASA



Photo courtesy of NASA

Left: James A. Van Allen (center) joins William A. Pickering (left) director of the Jet Propulsion Laboratory, and Werhner von Braun (right), developer of the V-2 rocket in Germany before becoming director of the U.S. Army's ballistic missile agency, in showing reporters a mockup of Explorer 1 at a press conference celebrating the satellite's first orbit.

Explorer 3, which was launched on March 26, 1958. For that flight, Van Allen and his colleagues designed and developed the first tape recorder used in space. His research continued on Explorer 4, which was launched two months later. The first Soviet confirmation of the existence of the Van Allen belts came from Sputnik 3, which was launched in 1958.

"The first public announcement of what are now called the Van Allen Radiation Belts was made on the first of May 1959," he says. "The name came from a reporter's question. I was describing these bands of particles we had discovered, and a reporter said, 'Do you mean, like a belt?' And it stuck."

Van Allen's involvement in the Explorer program followed him back to the University of Iowa, which has been immersed in space exploration ever since. A "spacecraft factory" within Van Allen Hall has since contributed more than 50 campus-built instruments and nine complete spacecraft to the U.S. space program. The first flights to Venus, Mars, Saturn, Uranus, Jupiter and Neptune all carried instruments developed at Van Allen Hall by its namesake and an extensive team of space physicists.

Now semi-retired, Van Allen has only recently found the time

to study the dog-eared, long-hand scientific notes he penned 40 years ago aboard the U.S.S. Glacier, before the world had heard of Sputnik. It's been a labor of love, too long deferred.

"When I came back from Antarctica in November of 1957, I was totally embroiled in Explorer 1 through 4, and I was only able to do a rough study of the rock-oon data we had collected," he says. "We were the only ones making these kinds of surveys then, which proved to be a period of maximum solar activity in recent decades. So, in part it's an

obligation—both personal and professional—to do the best to get all the data I could get out of that expedition."

Tom Walsh is a freelance writer working for Via Satellite. Walsh is also teaching Journalism at Dublin City University in Dublin, Ireland.

Below: University of Iowa space physicist James A. Van Allen plants a good-luck kiss on the payload for Explorer 4. The instrument was built in a basement laboratory at the university and launched on July 26, 1958, to detect high-altitude nuclear bomb blasts over the South Pacific.



Photo courtesy of NASA



Photo by Robert de Silva

astronomers of an earlier age with laying down the physical groundwork of today's core satellite constellations. But in any history of the era of manmade satellites and space-based communications, the name and the contributions of Arthur C. Clarke invariably surface.

Clarke recently granted us permission to excerpt a few relevant lines from his thoughts and historic writings on communications via satellite.

Speculating in February 1945 on the possibility of outfitting the German V2 rockets at that time falling on London with a powerful second stage, Clarke suggested

correct distance from the earth would make one revolution every 24 hours; i.e., it would remain stationary above the same spot and would be within optical range of nearly half the earth's surface.

Three repeater stations, 120 degrees apart in the correct orbit, could give television and microwave coverage to the entire planet."—Letter to the Editor, *Wireless World*, February 1945.

Noting just three months later that "there is at least one purpose for which the [space] station is ideally suited and indeed has no practical alternative," Clarke predicted the use of communications satellites in geosynchronous orbit

NOTES FROM ARTHUR C. CLARKE

by Scott Chase

THE YEAR 1997 marks the 40th anniversary of the launch of Sputnik and, appropriately enough, the 80th birthday of Arthur C. Clarke, one of the most

that it would be possible to have an instrumented payload "circling the earth perpetually outside the limits of the atmosphere and broadcasting information as long

to provide various services which he grouped under the general heading of television. He explained his categorization in this way:

FUTURIST, PHILOSOPHER, AUTHOR AND THE

fascinating and prolific minds of the 20th century. Clarke, known to millions as the novelist who penned such sci-fi masterpieces as *2001: A Space Odyssey* (1968) and *Rendezvous*

with Rama "FATHER" OF COMMUNICATIONS VIA SATELLITE (1973), early on

was recognized by a small group of space pioneers as the man who, in various articles published in 1945, first postulated the geosynchronous orbit and a global system of communications satellites based on just three heavenly parking spaces.

Clarke in the intervening years has gone out of his way to credit Isaac Newton, Johannes Kepler and other mathematicians and

as the batteries lasted. Since the rocket would be in brilliant sunlight for half the time, the operating period could be indefinitely prolonged by the use of thermo-

couples and photoelectric elements.

"Both of these developments demand nothing new in the way of technical resources; the first and probably the second should come within the next five or ten years. However, I would like to close by mentioning a possibility of the more remote future—perhaps half a century ahead.

"An artificial satellite at the

"In the following discussion the word television will be used exclusively but it must be understood to cover all services using the UHF spectrum and higher. It is probable that television may be among the least important of these as technical developments

occur. Other examples are frequency modulation, facsimile (capable of transmitting 100,000 pages an hour), specialized scientific and business services, and navigational aids.

"All of these problems can be solved by the use of a chain of space stations with an orbital period of 24 hours, which would require them to be at a distance of 42,000 km from the center of the

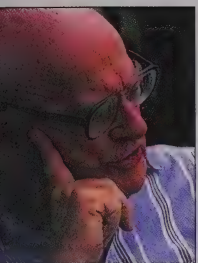


Photo by Richard J. Silber

Earth. There are a number of possible arrangements for such a chain. The stations would lie in the Earth's equatorial plane and would thus always remain in the same spots in the sky, from the point of view of terrestrial

observers. Unlike all other heavenly bodies they would never rise nor set. This would greatly simplify the use of directive receivers installed on the Earth.

"The following longitudes are provisionally suggested for the stations to provide the best service to the inhabited portion of the globe, although all parts of the planet will be covered.

30 degrees E—Africa and Europe.

150 degrees E—China and Oceania.

90 degrees W—The Americas.

"The receiving equipment at the Earth end would consist of small parabolas perhaps a foot in diameter with dipole pickup...They would be

aimed at the station with the least zenithal distance and once adjusted need never be touched again." — Excerpts from a privately circulated letter of May 1945 entitled *The Space-Station: Its Radio Applications*.

In his historic October 1945 article in *Wireless World*, Clarke came to the following conclusions:

"Briefly summarized, the advantages of the space station are as follows:

- (1) It is the only way in which true world coverage can be achieved for all possible types of service.
- (2) It permits unrestricted use of a band at least 100,000 Mc/s wide, and with the use of beams an almost unlimited number of channels would be available.
- (3) The power requirements are extremely small since the efficiency of illumination will be almost 100 per cent. Moreover, the cost of the power would be very low.
- (4) However great the initial expense, it would only be a fraction of that required for the world networks

replaced, and the running costs would be incomparably less."

Clarke in recent years has chuckled at the timeframes he prophesied for the advent of commercial communications via satellite. Back in 1945 he suggested widespread space-based "telepower" services within 50 years, or by 1995. This, he admits in retrospect, "certainly makes me look like a dyed-in-the-wool conservative."

Whatever he looks like, Arthur C. Clarke has been an inspiration to millions around the world and has richly deserved his honorary title as "the father of satellite communications." His predictions on the emergence of a fully interconnected global village have long been vindicated, and his disciples eagerly await his words on life—and communications—in the 21st century.



*Scott Chase is the executive editor and publisher of **Via Satellite**.*

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MEMORIES AND MILESTONES

THIS HISTORICAL SUPPLEMENT was made possible by the support of many leading names in the satellite industry. *Via Satellite* asked these companies to shed some light on their own contributions to the history of satellite communications.

Telesat Canada: Celebrating 25 Years in Space

On November 9, 1972, the world entered a new era of satellite communications with the launch of an historic Canadian satellite—Telesat Canada's Anik A1. A quarter century later, the company at the forefront of that great moment begins a new chapter in its amazing story.

Telesat is Canada's national satellite communications company, providing telecommunications and broadcast distribution services throughout North America. The company is also a leading provider of wireless services to Canadian business, and a sought-after consultant, operator and partner in ventures all over the world.

Telesat satellites carry television and radio broadcasting as well as voice and data communications networks. Its customers include major telephone companies and broadcasters, leaders in the retail, financial, transportation, manufacturing and resource industries, and government agencies and private companies on five continents.

Twenty-five years after launching the world's first domestic communications satellite into geostationary orbit, Telesat remains an international leader in satellite communications and systems management. As the world's most experienced domestic satellite operator, Telesat welcomes greater competition at home and is eager to seize unprecedented new opportunities abroad. Telesat recently announced plans to build and launch Canada's first high-power direct broadcast satellite, which will begin serving customers in late 1998. This announcement is only the beginning, as the company moves forward with plans to bring its customers a new, world-class fleet of communications satellites in exciting years to come.

Telesat is headquartered just outside Ottawa, Canada's national capital. The company maintains sales offices and teleport complexes in centers across Canada, as well as field offices around the world.

The Aerospace Corp.: A Presence in the Industry

The Aerospace Corp. is a private, nonprofit corporation, whose purposes are exclusively scientific: to provide research, development, and advisory services for space systems. The corporation provides architecture-engineering required to develop space, launch, and ground systems, from initial concept and design to deployment and operation. Its primary customer is the Air Force Space and Missile Systems Center.

Created in 1960, Aerospace Corp. has been involved in the development of space systems for nearly all 40 years of the satellite industry. In its first decade, Aerospace participated in systems engineering for approximately half of all satellites orbited by the United States. In 1963, the company began studies that eventually culminated in the Air Force's 24-satellite Global Positioning System constellation, which provides navigational capabilities to users around the world. For its GPS work, Aerospace was awarded the 1992 NAA Robert J. Collier trophy.

Today the corporation is increasingly involved in the interaction between military satellite programs and burgeoning civil, commercial, and international space applications, including trends toward smaller, less-expensive, off-the-shelf satellite systems and components.

Aerospace Corp. provides the primary engineering oversight for all Department of Defense space launches, and often participates in launch readiness reviews for NASA, NOAA, other civil agencies, and international organizations. It performed reviews of hardware and critical components of the launch vehicles for NASA's Pathfinder Mission to Mars and the Mars Global Surveyor.

During the 1970s, Aerospace supported communications, meteorological, navigational, and reconnaissance satellites, and numerous related programs and technology. Objectivity, excellence, and integrity are hallmarks of the corporation.

IDB: Time and Time Again

Throughout history, communication has driven men to create the spoken word, invent paper and writing implements, develop the telegraph, telephone, and more recently, the satellite.

In its short life, IDB Systems, a division of WorldCom, has become a leader in the design, construction and installation of earth stations around the world. IDB Systems made its own mark on history by commissioning the first privately-owned Intelsat earth station in the United States, breaking the monopoly of the U.S. signatory.

More importantly, IDB Systems has contributed to communicating worldwide events in our own time. The company provided satellite uplinks during several Democratic and Republican conventions, all the Olympic Games since 1984 and the 1988 U.S. and Soviet summit in Moscow, paving the way for Soviet countries to become independent states. During natural disasters such as Hurricane Andrew in 1992 and the 1989 San Francisco earthquake, IDB Systems provided telephone restoral services via satellite. In 1989, IDB Systems set up satellite communications for U.S. doctors using a teleconference link to treat Armenian earthquake victims. And just hours after the 1995 Oklahoma City bombing, IDB Systems set up flyaway systems for national media.

History notwithstanding, IDB Systems sets itself apart from other earth station suppliers in another very important way. As the fourth largest telecommunications company in the United States, WorldCom (IDB Systems' parent company) depends on IDB Systems satellite equipment to carry its network traffic, providing a unique user perspective.

Having designed and constructed more than 500 temporary and permanent earth stations worldwide, it goes without saying—IDB Systems stands the test of time.

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- ☐ 06. Retailer
- ☐ 07. Transportation
- ☐ 08. University/School
- ☐ 09. End Users (Corporate/Commercial/Industrial)

B. What best describes your job title? (check only one)

- ☐ 22. Pres./CEO/Owner
- ☐ 23. Vice Pres./General Mgr.
- ☐ 24. Mktg./Sales Mgmt.
- ☐ 25. News/Program Director
- ☐ 26. Engineering Mgmt./Tech.
- ☐ 27. Operations Mgmt.
- ☐ 28. Purchasing Mgmt.
- ☐ 29. Communications Mgmt.
- ☐ 30. Network Mgmt.
- ☐ 31. Other (specify) _____

C. Number of employees at your location?

- ☐ 38. 1-50
- ☐ 39. 51-100
- ☐ 40. 101-500
- ☐ 41. 501-1000
- ☐ 42. 1001-5000
- ☐ 43. 5001-10000
- ☐ 44. 10000+

D. In the next 12 months, what satellite transmission services do you plan to buy? (Check as many as apply)

- ☐ 45. Data Transmission
- ☐ 46. Uplinking/Downlinking
- ☐ 47. Internet Transmission
- ☐ 48. Mobile Uplinking/Downlinking
- ☐ 49. Satellite News Gathering
- ☐ 50. Teleconferencing and Videoconferencing
- ☐ 51. Video Transmission

E. What is your monthly transmission services expenditure?

- ☐ 52. Up to \$10,000
- ☐ 53. \$10,001 - \$25,000
- ☐ 54. \$25,001 - \$50,000
- ☐ 55. \$50,001 - \$100,000
- ☐ 56. Over \$100,000

F. In the next 12 months, what satellite products do you plan to buy? (Check as many as apply)

- ☐ 57. Adapters/Converters
- ☐ 58. Amplifiers
- ☐ 59. Antennas
- ☐ 60. Cables/Connectors

A. What best describes your firm's primary business? (check only one)

End User (Corp./Comm./Indus.)

- ☐ 01. Computers
- ☐ 02. Financial
- ☐ 03. Healthcare
- ☐ 04. Hotel/Lodging
- ☐ 05. Petroleum Retailer
- ☐ 06. Retailer
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- ☐ 43. 5001-10000
- ☐ 44. 10000+

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- ☐ 58. Amplifiers
- ☐ 59. Antennas
- ☐ 60. Cables/Connectors

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18	40	62	84	106	128	150	172	194	216	238	260
19	41	63	85	107	129	151	173	195	217	239	261
20	42	64	86	108	130	152	174	196	218	240	262
21	43	65	87	109	131	153	175	197	219	241	263
22	44	66	88	110	132	154	176	198	220	242	264

- ☐ 61. Earth Stations
- ☐ 62. Feeds/Feed Systems
- ☐ 63. Modulators/Demodulators
- ☐ 64. Filters
- ☐ 65. Power Supplies/Products
- ☐ 66. Multiplexers/Modems
- ☐ 67. Transceivers/Receivers
- ☐ 68. Shelters/Shielding/Mounts
- ☐ 69. Satellite News Gathering Vehicles
- ☐ 70. Software
- ☐ 71. Tele/Videoconferencing Systems and Products
- ☐ 72. Test Equipment
- ☐ 73. VSAT Systems
- ☐ 74. Internet Products
- ☐ 75. Digital Video Systems
- ☐ 76. RF Switches

- ☐ 81. Earth Stations
- ☐ 82. Feeds/Feed Systems
- ☐ 83. Modulators/Demodulators
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- ☐ 92. Test Equipment
- ☐ 93. VSAT Systems
- ☐ 94. Internet Products
- ☐ 95. Digital Video Systems
- ☐ 96. RF Switches

- ☐ 97. Up to \$10,000
- ☐ 98. \$10,001 - \$25,000
- ☐ 99. \$25,001 - \$50,000
- ☐ 100. \$50,001 - \$100,000
- ☐ 101. Over \$100,000

- ☐ 102. Up to \$10,000
- ☐ 103. \$10,001 - \$25,000
- ☐ 104. \$25,001 - \$50,000
- ☐ 105. \$50,001 - \$100,000
- ☐ 106. Over \$100,000

H. In the next 12 months, what satellite technical services do you plan to buy? (Check as many as apply)

- ☐ 107. Needs Assessment, Site Survey and Prep.

- ☐ 83. Construction, Installation and Implementation
- ☐ 84. Design/Engineering
- ☐ 85. Frequency Coord. and License Preparation
- ☐ 86. Launch Services
- ☐ 87. Maint. and Operating Services
- ☐ 88. System/Hardware/Software Integration
- ☐ 89. Satellite Manufacturing Services

- ☐ 90. Up to \$10,000
- ☐ 91. \$10,001 - \$25,000
- ☐ 92. \$25,001 - \$50,000
- ☐ 93. \$50,001 - \$100,000
- ☐ 94. Over \$100,000

- ☐ 95. Recommended
- ☐ 96. Specify
- ☐ 97. Evaluate
- ☐ 98. Approve
- ☐ 99. Not involved

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ZIP/PC _____ Country _____

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A. What best describes your firm's primary business? (check only one)

End User (Corp./Comm./Indus.)

- ☐ 01. Computers
- ☐ 02. Financial
- ☐ 03. Healthcare
- ☐ 04. Hotel/Lodging
- ☐ 05. Petroleum Retailer
- ☐ 06. Retailer
- ☐ 07. Transportation
- ☐ 08. University/School
- ☐ 09. End Users (Corporate/Commercial/Industrial)

B. What best describes your job title? (check only one)

- ☐ 22. Pres./CEO/Owner
- ☐ 23. Vice Pres./General Mgr.
- ☐ 24. Mktg./Sales Mgmt.
- ☐ 25. News/Program Director
- ☐ 26. Engineering Mgmt./Tech.
- ☐ 27. Operations Mgmt.
- ☐ 28. Purchasing Mgmt.
- ☐ 29. Communications Mgmt.
- ☐ 30. Network Mgmt.
- ☐ 31. Other (specify) _____

C. Number of employees at your location?

- ☐ 38. 1-50
- ☐ 39. 51-100
- ☐ 40. 101-500
- ☐ 41. 501-1000
- ☐ 42. 1001-5000
- ☐ 43. 5001-10000
- ☐ 44. 10000+

D. In the next 12 months, what satellite transmission services do you plan to buy? (Check as many as apply)

- ☐ 45. Data Transmission
- ☐ 46. Uplinking/Downlinking
- ☐ 47. Internet Transmission
- ☐ 48. Mobile Uplinking/Downlinking
- ☐ 49. Satellite News Gathering
- ☐ 50. Teleconferencing and Videoconferencing
- ☐ 51. Video Transmission

E. What is your monthly transmission services expenditure?

- ☐ 52. Up to \$10,000
- ☐ 53. \$10,001 - \$25,000
- ☐ 54. \$25,001 - \$50,000
- ☐ 55. \$50,001 - \$100,000
- ☐ 56. Over \$100,000

F. In the next 12 months, what satellite products do you plan to buy? (Check as many as apply)

- ☐ 57. Adapters/Converters
- ☐ 58. Amplifiers
- ☐ 59. Antennas
- ☐ 60. Cables/Connectors

A. What best describes your firm's primary business? (check only one)

End User (Corp./Comm./Indus.)

- ☐ 01. Computers
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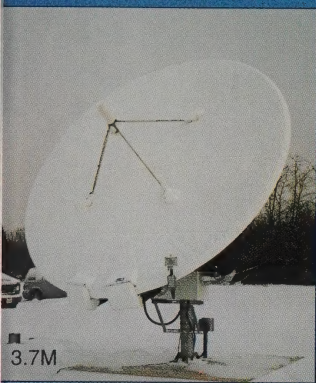
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- ☐ 58. Amplifiers
- ☐ 59. Antennas
- ☐ 60. Cables/Connectors

October 1997 Issue

Circle Numbers for FREE Product Information

1	23	45	67	89	111	133	155	177	199	221	243
2	24	46	68	90	112	134	156	178	200	222	244
3	25	47	69	91	113	135	157	179	201	223	245
4	26	48	70	92	114	136	158	180	202	224	246
5	27	49	71	93	115	137	159	181	203	225	247
6	28	50	72	94	116	138	160	182	204	226	248
7	29	51	73	95	117	139	161	183	205	227	249
8	30	52	74	96	118	140	162	184	206	228	250
9	31	53	75	97	119	141	163	185	207	229	251
10	32	54	76	98	120	142	164	186	208	230	252
11	33	55	77	99	121	143	165	187	209	231	253
12	34	56	78	100	122	144	166	188	210	232	254
13	35	57	79	101	123	145	167	189	211	233	255
14	36	58	80	102	124	146	168	190	212	234	256
15	37	59	81	103	125	147	169	191	213	235	257
16	38	60	82	104	126	148	170	192	214	236	258
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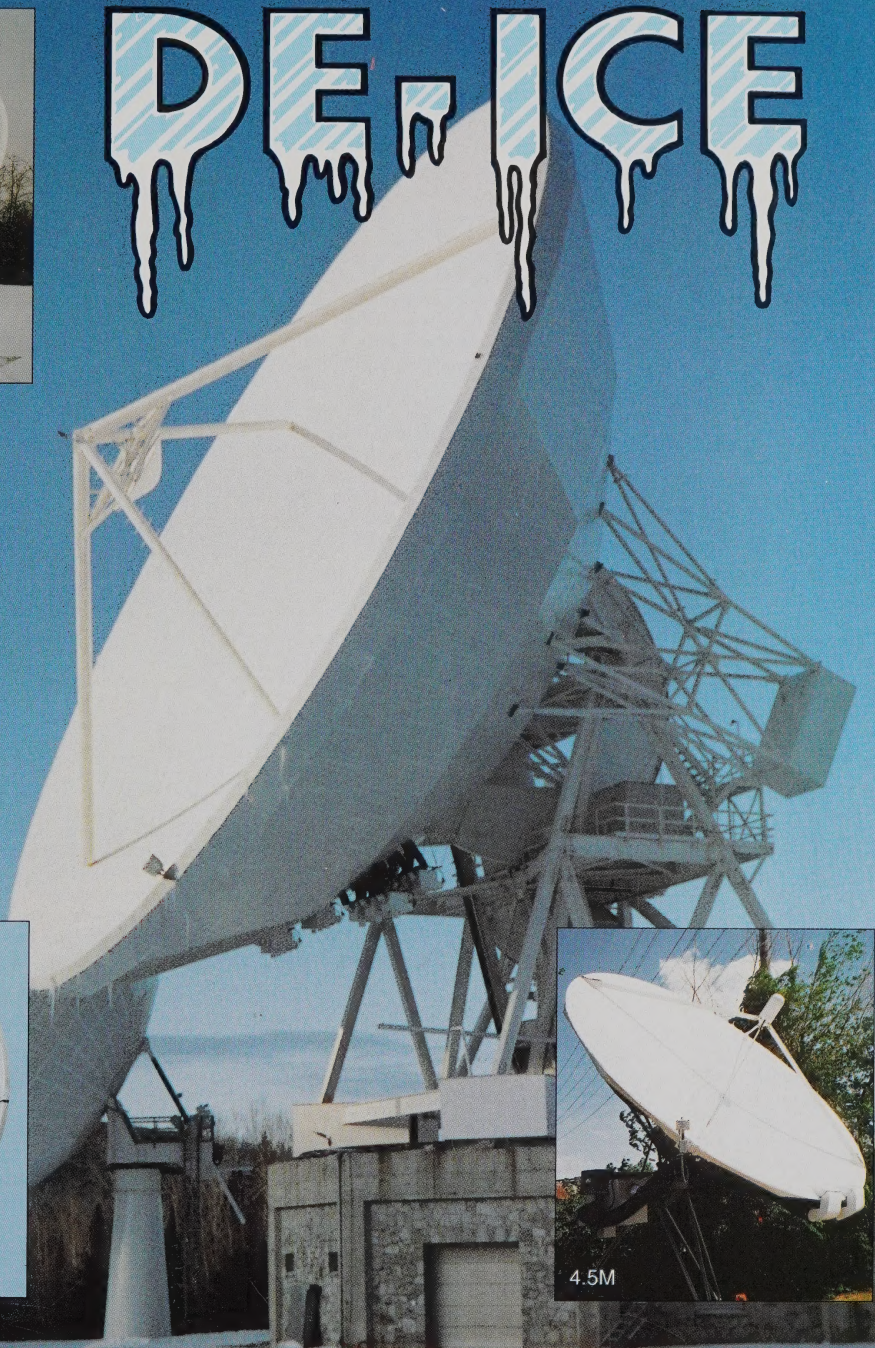
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COMSAT Corporation: The Road to the Future

As a start-up company in the 1960s, COMSAT Corp. launched and operated "Early Bird," the first geosynchronous satellite to deliver telephone calls and television broadcasts across the Atlantic Ocean. The engineering and operating success of Early Bird and subsequent INTELSAT satellites gave rise to what has become one of today's most thriving and competitive global industries.

Countless additional milestones have marked COMSAT's 35 years in the business. COMSAT transmitted the worldwide broadcast of man's first step on the moon. The company established Marisat (forerunner to today's Inmarsat) for maritime and mobile communications. Later COMSAT developed a large number of digital technologies to increase the speed, quality and efficiency of satellite transmissions. The company invented technologies to remove echoes from satellite calls and designed the highest quality, most affordable satellite news gathering equipment on the market today. COMSAT also invented powerful software to plan, monitor and control satellite networks, and last year introduced Planet 1, the world's first personal satellite telephone.

Today, COMSAT is setting new milestones with unique satellite networking technologies and services for simultaneous Internet, high-speed data and multimedia communications—technologies that make satellites as seamless a part of global networks as fiber optic cable. These technologies and their successors promise to make the latest generations of high-powered geosynchronous satellites competitive throughout their long lives—even as consumer demands grow and change in ways yet to be imagined.

British Telecom: Paving the Way in the U.K.

BT Broadcast Services transmitted the first television signals in the United Kingdom in 1946 and the first international satellite TV broadcast in 1962. Since then, we have built the network, the earth stations, the satellite capacity—and the subscriber management and conditional access software systems to integrate and manage your television contribution and distribution networks. Today, virtually every television picture seen on a U.K. television—whether satellite, terrestrial or cable—will have been carried at some stage by BT.

We will continue to develop our infrastructure, playing our part in the digital revolution, delivering multimedia and interactive services as well as developing applications for media and broadcast industries creating solutions that deliver tomorrow's technology today.

Contact us at: +44/171-406-7000, fax: +44/171-406-7252, or visit our World Wide Web site, <http://www.vbs.bt.co.uk>.

Crown Broadcast International:

As the satellite industry celebrates its 40th birthday, Crown International celebrates 50 years of service to the audio and broadcast markets. Crown, a privately held company, designs and manufactures audio and data communications products for distribution in over 87 countries. Crown's success was exemplified in 1996 when it experienced growth of over 37 percent and revenues of \$100 million.

Crown's new product line, SpectraCast, includes headend multiplexing tools and integrated receiver decoders. SpectraCast is characterized by modularity, efficiency, and value. The IRDs, for example, offer three interchangeable RF receiver modules operating up to 40 Mbps in fixed and variable bandwidths. The IRDs are capable of receiving several stereo and monaural channels simultaneously as well as data in rates of 300 bps to 6 Mbps. Audio decoding and mixing, permissioning, and internal store and forward options ensure versatile operation.

This convergence of leading-edge technologies means that SpectraCast may provide performance significantly better than competitive products. Consider also the efficiency of SpectraCast which leads to cost savings in the hundreds to thousands of dollars per site. Such efficiencies also characterize the MPEG data transport multiplexer and the associated network management and control software modules. Designed for scalable MCPC networks, these tools enable you to select the bandwidth you need, eliminating wasted capacity and maximizing space segment usage.

The value of SpectraCast lies in meeting your broadcast requirements and in providing increased network functionality. For more information, call David Molinaro at 219/294-8143 or visit www.crown-broadcast.com on the Web.

W.B. Walton Enterprises: Breaking the Ice

It all started in a Holiday Inn parking lot in San Francisco in 1979.

While watching Scientific-Atlanta installers erect a 5-meter antenna for the first Hi Net demo for their franchise hotel operations, Bill Walton, Jr., founder of Walton Enterprises, met a young man by the name of Dick Gall from Communication Technologies Inc. (CTI). Mr. Gall was consulting to the Holiday Inns program and was also involved with the installation of two 10-meter Scientific-Atlanta antennas for Johns-Mansville Corp. in Littleton, CO.

"Mr. Gall asked if I could come up with a way of De-Icing antennas that looked good for the Colorado facility," Walton says. "I told him I could but why do they De-Ice antennas?"

What came to mind was the building of a lightweight, well insulated room on the back of the antenna and heating the air in the room. From that point on the De-Icing of satellite antennas took on a completely new look.

With the help of many employees and customers Walton Enterprises has been able to develop a very efficient and dependable De-Icing System. For the past 15 years we have manufactured our own natural and propane gas heating systems. We use stainless steel electric heaters designed by Walton Enterprises and built by others.

The new Teflon Cover is a great addition to our line of equipment to prevent outages due to ice or snow. "I would like to take this opportunity to thank all of the wonderful people in this industry who have allowed me to be a part of it," Walton concludes. "As an outsider in the early days of Hot-Air De-Icing I was given (perhaps more than I deserved) time to develop the equipment and business reputation far beyond my expectations. We at Walton Enterprises have worked very hard to develop reliable equipment and a reputation for reliability and dependability of our personnel and equipment. Again—thank you for allowing us to be a part of this great industry."

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